

Global Teaching InSights

A video study of teaching



User Guide and Codebook

This document describes the raw and derived data resulting from Global Teaching InSights (which results from the TALIS Video Study project).

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2 Overview

In this document we discuss the international dataset produced by Global Teaching Insights (resulting from the TALIS Video Study project). Data is provided in .csv format. A codebook describing and summarizing all variables is provided for each file as a separate document.

3 Files in the dataset

Our international dataset consists of the following seven files:

1. **Student-level file**: This student-level file¹ includes all data from the student pre-questionnaire, student post-questionnaire, student achievement pretest, and student achievement posttest, as well as the student-level derived variables used in our analysis.
2. **Teacher-level file**: This teacher-level file includes all data from the teacher pre-questionnaire and teacher post-questionnaire, as well as the teacher-level derived variables from the questionnaires, teacher log, video observation codes, and artefact codes used in our analysis.
3. **School-level file**: This school-level file includes characteristics of the participating schools, including metrics for size and urbanicity.
4. **Teacher log file**: This teacher-by-lesson-level file includes subtopic coverage and lesson length data from the teacher logs.
5. **Video component rating file**: This teacher-by-video-by-rater-level file includes rating data for video components, and component segment-level derived variables used in our analysis.
6. **Video indicator rating file**: This teacher-by-video-by-rater-level file includes rating data for video indicators, and indicator segment-level derived variables used in our analysis.
7. **Artefact rating file**: This teacher-by-artefact set-by-rater-level file includes rating data for classroom artefacts.

Complementing each file is a separate codebook document, which provides the following information for the included variables:

- Variable name
- Variable type
- Variable label (including questionnaire/item text, where applicable)
- Number of unique values
- Possible values with labels and frequencies (including response option text, where applicable)
- For continuous variables, mean, standard deviation, and percentiles

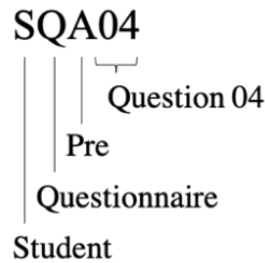
The files contain raw data from several instruments, as well variables created during analysis using the raw data. In this document and in the datafiles, we use acronyms to refer to the different instruments fielded for data collection. These acronyms are listed here:

- SQA – student pre-questionnaire
- SQB – student post-questionnaire
- STA – student pretest
- STB – student posttest
- TQA – teacher pre-questionnaire
- TQB – teacher post-questionnaire
- TL – teacher log

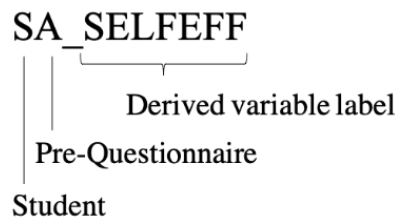
¹ We use the term “X-level” file to indicate the level of data aggregation. For example, a “student-level file” has one row for each student, while a “teacher-by-lesson level file” has one row for each lesson for each teacher.

- STU_ROS – student roster
- STU_RES – student sampling resolution
- TEA_RES – teacher sampling resolution
- SCH_RES – school sampling resolution

Variables follow one of two naming conventions, depending on whether the variable is from the raw data provided by the countries/economies, or derived for the purpose of analysis. Raw variables are named as follows:



while derived variables are named as follows:



For each data file, the variables are ordered by dataset, with the raw variables appearing first, followed by derived variables.

Note that we did not make corrections to raw student or teacher data, even in cases where the response was clearly in error².

² For example, in response to questions about amount of time spent preparing for or teaching a mathematics class, or time taken to complete a test or questionnaire.

4 Records included

Our samples include all students who provided consent to at least one data collection instrument (questionnaire, test, or video) on the roster and resolution forms provided by the countries/economies, and the corresponding schools and teachers.

In most cases, all students in the original data sent by countries/economies actively consented to all three data collection instruments. In a few cases, however, students who refused consent for an instrument or students without complete consent information were included in the data. If a student was missing consent information for an instrument, we treated this student as having actively refused consent for that instrument, and data for this student for this instrument was converted to “missing” in the final dataset presented here. Student records were dropped from the dataset only if consent was missing or refused for all instruments.

We created flags for the following scenarios where it may be appropriate to drop records for analysis:

- Absent students
- Students who dropped midway through the study

While students who are flagged with these variables were not dropped from the dataset, in many cases they are missing some or all data, and therefore they were usually not included in the analyses.

Additionally, we performed a universalization process whereby we harmonized the records in each raw data file received from countries and economies. This ensured that all student and teacher records appearing in one dataset appear in every other dataset, even if data was missing in some cases.

Note that there are instances in which a student or teacher was present on the day of data collection (i.e. not absent) but does not have data for a certain instrument. To signal cases of missing data, we created variables indicating the number of missing items in tests and questionnaires:

- SA_NUMQMISS – Number of missing items in student pre-questionnaire.
- SB_NUMQMISS – Number of missing items in student post-questionnaire
- STA_NMISS – Number of missing items in student pre-test
- STB_NMISS – Number of missing items in student post-test
- TA_NMISS – Number of missing items in teacher pre-questionnaire
- TB_NMISS – Number of missing items in teacher post-questionnaire

The best way to filter for missing data is using these variables.

5 Variables in the dataset

5.1 Identification variables

Throughout our data files, we use a consistent identification (ID) assignment scheme. Each country/economy, school, teacher, and student is assigned a unique ID, according to the following naming convention:

- **IDCOUNTRY** – A three-digit code identifying the countries and economies. Countries and economies were assigned the following IDs:

Country/Economy	ID
Bíobio-Metropolitana-Valparaíso (Chile)	152
Shanghai (China)	156
Colombia	170
Germany*	276
Kumagaya, Shizuoka, Toda (Japan)	392
Mexico	484
Madrid (Spain)	724
England (UK)	826

Note: The German dataset was collected from schools in seven of the 16 laenders. This is signalled by an asterisk appearing next to Germany's name.

- **IDSCHOOL** – A four-digit code identifying schools within a country/economy. These IDs do not have any relationship to the national school IDs.
- **IDTEACH** – A two-digit code identifying teachers within a school. This ID was initially intended to take only values 01 and 02, indicating whether the teacher was the first or second sampled teacher from the school; however, there were many deviations from this strategy and so this numbering convention does not hold true in all cases.
- **IDSTUDENT** – A three-digit code identifying students within a class.
- **SCH_ID** – A 10-digit unique identifier for each school in the study. This is the combination of IDCOUNTRY and IDSCHOOL, with leading zeros, separated by a hyphen. For example, 00152-0049 indicates school 49 in B-M-V (Chile). We recommend using this identifier as a string (instead of a numeric) variable for merging purposes.
- **T_ID** – A 15-digit unique identifier for each teacher in the study. This is the combination of IDCOUNTRY, IDSCHOOL and IDTEACH, with leading zeros, separated by hyphens. For example, 00152-0049-0001 indicates teacher 1 from school 49 in B-M-V (Chile). We recommend using this identifier as a string (instead of a numeric) variable for merging purposes.
- **S_ID** – A 20-digit unique identifier for each student in the study. This is the combination of IDCOUNTRY, IDSCHOOL, IDTEACH, and IDSTUDENT, with leading zeros, separated by hyphens. For example, 00152-0049-0001-0015 indicates student 15 in the class of teacher 1 from school 49 in B-M-V (Chile). We recommend using this identifier as a string (instead of a numeric) variable for merging purposes.

- **IDRATER** – A two-digit code identifying the rater responsible for producing ratings for a given video segment or artefact.
- **IDINSTR** – An alphabetic code indicating the type of video or artefact, taking on the values in the table below:

Value	Label
TAT	Unit assessment
TAA	Artefact from video day 1
TAB	Artefact from video day 2
TAC	Artefact from day following video 1
TAD	Artefact from day following video 2
TVA	Video of lesson 1
TVB	Video of lesson 2

- **IDDATE** – An eight-digit code identifying an artefact’s date, in the form DDMMYYYY.
- **IDVIDEO** – The combination of IDCNTRY, IDSCHOOL, IDTEACH, IDINSTR, and IDDATE for each video, with leading zeros, separated by hyphens. This ID uniquely identifies videos within the international dataset. For example, 152-0049-02-TVA-17052018 indicates a video of lesson 1 taken on 17 May 2018 by teacher 2 from school 49 in B-M-V (Chile).
- **IDARTEFACT** – The combination of IDCNTRY, IDSCHOOL, IDTEACH, IDINSTR, and IDDATE for each artefact, with leading zeros, separated by hyphens. This ID uniquely identifies artefacts within the international dataset. For example, 152-0049-01-TAT-28082018 indicates a unit assessment administered on 28 August 2018 by teacher 1 from school 49 in B-M-V (Chile).

The following table indicates which identification variables are included in each file. The cell contains an “X” if the variable is included in the file.

Variable	Student-level	Teacher-level	School-level	Teacher log	Video component rating	Video indicator rating	Artefact rating
IDCNTRY	X	X	X	X	X	X	X
IDSCHOOL	X	X	X	X	X	X	X
IDTEACH	X	X		X	X	X	X
IDSTUDENT	X						
SCH_ID	X	X	X	X	X	X	X
T_ID	X	X		X	X	X	X
S_ID	X						
IDRATER					X	X	X

IDINSTR					X	X	X
IDDATE					X	X	X
IDVIDEO					X	X	
IDARTEFACT							X

5.2 Administrative variables

Observations in the dataset contain some administrative variables where applicable. For example, these indicate the date an instrument or video was taken, time taken to complete an instrument, absence, and inclusion in the original files.

- **COUNTRY** – Variable giving the name of the country to which the record belongs.
- **CONSENT_QUES_N_STU_RES** – Indicates that the student consented in the student sampling resolution to the questionnaire portion of the study.
- **CONSENT_TEST_N_STU_RES** – Indicates that the student consented in the student sampling resolution to the test portion of the study.
- **CONSENT_VIDEO_N_STU_RES** – Indicates that the student consented in the student sampling resolution to the video portion of the study.
- **IN_ANALYSIS_outcome** – Indicates that the observation is included in the primary student outcome regression analyses. There are three **IN_ANALYSIS** flags corresponding to the three primary student outcomes of interest: **TEST** (test scores), **PINT** (personal interest in math), and **GENSELFEFF** (general self-efficacy).
- **MIDDROP** – Indicates that the student dropped out midway through the study.
- **ABSENT_instrument** – Indicates that the student was marked absent when the instrument was administered. This variable is included for the following instruments: **SQA** (student pre-questionnaire), **SQB** (student post-questionnaire), **STA** (student pretest), **STB** (student posttest).
- **DATE_instrument** – Date the instrument was administered, in the form DD/MM/YY. This variable is included for the following instruments: **SQA** (student pre-questionnaire), **SQB** (student post-questionnaire), **STA** (student pretest), **STB** (student posttest), **TQA** (teacher pre-questionnaire), **TQB** (teacher post-questionnaire). Note that variables **DATE_SQA_2**, **DATE_SQA_3**, **DATE_SQB_2**, and **DATE_SQB_3** apply only to data from K-S-T (Japan) because these student questionnaires were administered in multiple sections there.
- **DATE_RATE** – Date video or artefact was rated, in the form DD/MM/YY.
- **DATE_RATE_D** – Day video or artefact was rated.
- **DATE_RATE_M** – Month video or artefact was rating.
- **DATE_RATE_Y** – Year video or artefact was rated.
- **LESSON_DATE_D** – Day lesson was administered.
- **LESSON_DATE_M** – Month lesson was administered.
- **LESSON_DATE_Y** – Year lesson was administered.

- ***Instrument_STARTTIME***³ – Start time of instrument administration.
- ***Instrument_ENDTIME*** – End time of instrument administration.
- ***MINUTES_instrument*** – Minutes taken to complete the instrument. This variable is included for the following instruments: **SQA** (student pre-questionnaire), **SQB** (student post-questionnaire).
- ***RATING_START_TIME*** – Start time of rating session.
- ***RATING_END_TIME*** – End time of rating session.
- ***RATING_TIME_MINUTES*** – Minutes taken to rate.
- ***SEGMENTS_N*** – Number of segments in this video.
- ***FINAL_SEGMENTS_N*** – Number of segments in this video⁴.
- ***SEG_FLAG*** – Indicates whether a rater rated more segments than the other rater for the same video.
- ***SEGMENT_X*** – Indicates that this segment was rated, where X takes on the values 1-16 for indicators and 1-8 for components.
- ***TIME_SX*** – Time taken to rate indicators for this segment, where X takes on the values 1-16.
- ***CTIME_SX*** – Time taken to rate components for this segment, where X takes on the values 1-8.
- ***SEGMENTS_WITH_TIME*** – Number of segments for which a rating time was recorded, i.e. the variable ***TIME_SX*** or ***CTIME_SX*** is not missing.
- ***RATING_LENGTH_TIME*** – Time taken to rate the entire video, consisting of all segments.
- ***INVALIDSKIP*** – Derived indicator for whether at least one of the rating variables was skipped for artefacts, video components or video indicators.
- ***INVALIDSKIP_COUNT*** – Derived count for the number of invalid skips for the record.
- ***OUTOFRANGE*** – Derived indicator if there are any ratings out of range for the record.
- ***OUTOFRANGE_COUNT*** – Derived variable for the number of ratings out of range for the record.
- ***ACT_INCONSISTENT*** – Derived indicator for whether a rater assigned a 4 for any categories in activity structure and something other than a 1 for one of the other categories, resulting in activity structure rating inconsistency.
- ***TECH_INCONSISTENT*** – Derived indicator for whether a rater coded one of the categories for classroom technology with something other than 1, but assigned

³ Note that in K-S-T (Japan), the student pre- and post-questionnaires were split into 3 sections, and the sections were taken on different days in some classes. Thus, K-S-T (Japan) also submitted variables *instrument_STARTTIME_#*, *instrument_ENDTIME_#*, *MINUTES_#_instrument*, and *DATE_#_instrument_#* (where # is replaced with either 1, 2, or 3, indicating the section of questionnaire), and variable *SPLIT*, indicating if the sections were taken on different days.

⁴ For most records, this variable is identical to "SEGMENTS_N", but for 18 cases with video components and 23 cases with video indicators, a rater rated more segments than the other rater for same video. In those cases, the last two rated segments of the rater with more segments are averaged together so the number of segments is equivalent for the two raters (e.g., if rater A rated 3 segments and rater B 2 segments, then rater A's second and third segment ratings are averaged together to make new second segment ratings, and the third segment ratings are recoded as missing, and *FINAL_SEGMENTS_N* = 2 for both raters A and B).

technology for understanding as 1, resulting in classroom technology rating inconsistency.

- **ACT_INCONSISTENT_COUNT** – Derived variable for the number of video segments with activity structure rating inconsistency.
- **TECH_INCONSISTENT_COUNT** – Derived variable for the number of video segments with classroom technology rating inconsistency.
- **INCONSISTENT_1** – Derived indicator to flag a rating inconsistency. If an artefact set is rated 1 on “solving quadratic equations by factorizing,” it should also be rated 1 on “factoring expressions,” though the opposite is not necessarily true.
- **INCONSISTENT_2** – Derived indicator to flag a rating inconsistency. If an artefact set is rated 1 on “solving quadratic equations by completing the square” it should also be rated 1 on “factoring expressions,” though the opposite is not necessarily true.
- **INCONSISTENT_3** – Derived indicator to flag a rating inconsistency. Artefact sets that are rated as 2 or 3 on the component “Real-World Connections” should be rated 1 on the sub-topic “applying mathematics to real life situations.” A rating of 1 on that component should match a rating of 0 on this subtopic.
- **INCONSISTENT_4** – Derived indicator to flag a rating inconsistency. Unscorable artefact sets should have rating scores. However, raters should only rate 1 for one and only one of the three “unscorable/scorable” items; the other two should be 0.
- **COMMENT** – Additional feedback provided on this record by the participating country or economy.
- **COMMENT_TL** – Additional feedback provided on this lesson by the participating teacher.
- **FILE_TYPE** – Indicates the type of file from which the record was obtained.
- **EIGHT_MINUTES** – Derived variable for whether the rater took fewer than eight minutes to rate the artefact.
- **ARTEFACT_SET_UNIT** – Variable indicating which template source was used for the record.
- **NO_AVAILABLE** – Variable indicating whether no artefacts are available for this teacher and date.
- **NOT_SCORABLE** – Variable indicating whether artefacts for this teacher and date are available but not scorable.
- **UNSCORABLE_SCORED** – Derived indicator for whether an artefact marked as not scorable (**NOT_SCORABLE**==1) was scored.
- **SCORABLE_RATE** – Variable indicating whether artefacts for this teacher and date were scorable.

The following table indicates which administrative variables are included in each file. The cell contains an “X” if the variable is included in the file.

Variable	Student-level	Teacher-level	School-level	Teacher log	Video component rating	Video indicator rating	Artefact rating
COUNTRY	X	X	X	X	X	X	X
CONSENT_QUES_N_STU_RES	X						

CONSENT_TEST_N_STU_RES	X						
CONSENT_VIDEO_N_STU_RES	X						
IN_ANALYSIS_TEST	X						
IN_ANALYSIS_PINT	X						
IN_ANALYSIS_GENSELF EFF	X						
MIDDROP	X	X		X			
ABSENT_SQA	X						
ABSENT_SQB	X						
ABSENT_STA	X						
ABSENT_STB	X						
DATE_SQA	X						
DATE_SQB	X						
DATE_STA	X						
DATE_STB	X						
DATE_TQA		X		X			
DATE_TQB		X		X			
DATE_TL				X			
LESSON_DATE_D				X			
LESSON_DATE_M				X			
LESSON_DATE_Y				X			
DATE_RATE					X	X	X
DATE_RATE_D					X	X	X
DATE_RATE_M					X	X	X
DATE_RATE_Y					X	X	X
SQA_STARTTIME	X						
SQB_STARTTIME	X						
SQA_ENDTIME	X						
SQB_ENDTIME	X						
MINUTES_SQA	X						
MINUTES_SQB	X						
RATING_START_TIME							X
RATING_END_TIME							X
RATING_TIME_MINUTES							X
SEGMENTS_N					X	X	

FINAL_SEGMENTS_N					X	X	
SEG_FLAG					X	X	
SEGMENT_X					X	X	
TIME_SX						X	
CTIME_SX					X		
SEGMENTS_WITH_TIME					X		
RATING_LENGTH_TIME					X		
INVALIDSKIP					X	X	X
INVALIDSKIP_COUNT					X	X	
OUTOFRANGE					X	X	
OUTOFRANGE_COUNT					X	X	
ACT_INCONSISTENT						X	
TECH_INCONSISTENT						X	
ACT_INCONSISTENT_COUNT						X	
TECH_INCONSISTENT_COUNT						X	
COMMENT						X	X
COMMENT_TL				X			
FILE_TYPE					X	X	
EIGHT_MINUTES							X
INCONSISTENT_X							X
ARTEFACT_SET_UNIT							X
NO_AVAILABLE							X
NOT_SCORABLE							X
UNSCORABLE_SCORED							X
SCORABLE_RATE							X

5.3 Student file variables

The student-level file contains data from the student pre-questionnaire, the student post-questionnaire, the pretest, and the posttest. One observation in the dataset (which is one row in the file) includes all of the data collected from these four instruments for one student.

The student pre-questionnaire variables include student background characteristics, experience in mathematics, confidence, goals, behaviours, interests, views of teachers' practices, and content exposure.

The student post-questionnaire variables include students' experiences specifically relating to the unit on quadratic equations. This includes views of teachers' practices during the unit, confidence in the unit content, interest in the unit content, and content exposure.

The student pretest variables include raw responses to each question⁵ (in the form STA01 for question 1, for example), and corresponding derived scores for each question (in the form STA_SCORE01 for question 1, for example). The full set of raw responses for each country is presented first, followed by the item response theory (IRT) scores.

The student posttest variables include raw responses to each question (in the form STB01 for question 1, for example) and corresponding derived scores for each question (in the form STB_SCORE01 for question 1, for example). The full set of raw responses for each country is presented first, followed by the item response theory (IRT) scores.

Derived variables for the student-level file are included below, with variables used in the regression analyses marked with an asterisk. Scales calculated by averaging multiple responses are recorded as "missing" if fewer than half of the constituent responses are missing.

- **SQA23** – Variable derived from raw responses to SQA23 (recorded in SQA23_c)⁶. Calculated by cleaning SQA23_c responses according to the following rules:
 - If SQA23_c contains numeric characters only (except for 99, 999, 9999, 9991, or 99991), then SQA23 = SQA23_c
 - If SQA23_c = 99, 999, or 99991, then SQA23_c = 9999
 - If SQA23_c contains non-numeric characters (alphabetical, asterisk, percent sign, dash, plus, minus, etc.), then SQA23 = 9991
 - If SQA23_c = "N/A", then SQA23 = 9991
 - If SQA23_c = "I don't know", "I don't remember", "don't know", "not sure", "no se", or similar, then SQA23 = 9999This derived variable gives the student's mark in mathematics in the last school report.
- **SA_INTGRADE** – Derived variable for the grade the student is currently attending at school. Calculated by harmonizing the responses to SQA01 by country to the PISA equivalent grade level. See table 1.9.1 for harmonization rules.
- **SA_AGE** – Derived variable for the age of the student at the time of the student pre-questionnaire. Calculated by comparing the date of the pre-questionnaire with the birth date of the student, top and bottom coded if age is calculated to be less than 10 or over 22.
- **SA_FEMALE*** – Derived indicator for students identifying as female. SA_FEMALE=1 if SQA_03=1, and zero otherwise. The exception here is for K-S-T (Japan), where the response options were reversed, so this variable equals 1 if SQA03=2 in K-S-T (Japan) only, and zero otherwise.
- **SA_GENDER** – Single item indicator the gender of the student. Calculated as SA_GENDER=1 if the student is female and SA_GENDER=2 if the student is male.

⁵ Note that K-S-T (Japan) included extra questions on their pre- and post-questionnaires. The data for these questions is captured in SQANQXX and SQBNQXX, where XX takes on the value of the question number.

- **SA_IMMIG_1** – Derived indicator for whether the student is a first generation immigrant. Calculated as SA_IMMIG_1=1 if SQA_04Y=0, and SA_IMMIG_1=0 otherwise.
- **SA_IMMIG_2** – Derived indicator for whether the student is a second generation immigrant. Calculated as SA_IMMIG_2=1 if SQA_04M=1 and SQA_04F=1, and SA_IMMIG_2=0 otherwise. If information for one parent is missing, we calculate SA_IMMIG_2 using just the information for the parent with non-missing data.
- **SA_IMMIG_I*** – Derived indicator for whether the student has any immigrant background. Calculated as SA_IMMIG_I=1 if SA_IMMIG_1=1 or SA_IMMIG_2=1.
- **SA_IMMIG_N** – Derived indicator for whether the student is native to the participating country or economy. Calculated as SA_IMMIG_N=1 if SA_IMMIG_1=0 and SA_IMMIG_2=0.
- **SA_LANGHOME** – Single item indicator for whether the language spoken at the student’s home is the same language as the assessment. Calculated as SA_LANGHOME=1 if this is the case, and SA_LANGHOME=0 otherwise.
- **SA_SELFCON** – Scale measuring student self-concept in mathematics in general, calculated as the mean of SQA06A – SQA06F.
- **SA_LEARNGOAL** – Scale measuring student learning goal orientation in mathematics, calculated as the mean of SQA07A – SQA07C.
- **SA_INSTMOT** – Scale measuring student instrumental motivation in mathematics, calculated as the mean of SQA08A – SQA08D.
- **SA_PERSEVERE** – Scale measuring student effort and perseverance in mathematics, calculated as the mean of SQA09A – SQA09D.
- **SA_TESTANX** – Scale measuring student text anxiety in mathematics, calculated as the mean of SQA10A – SQA10C.
- **SA_HISTTEACHER** – Single item indicator for previous exposure to the same teacher, based on SQA11.
- **SA_SINT_PREV** – Single item scale measuring students’ situational interest in mathematics, based on their previous year teacher, as recorded in SQA, based on SQA12D.
- **SA_PINT_CURR** – Scale measuring students’ personal interest in mathematics, based on their current year teacher, as recorded in SQA. Calculated as the mean of SQA14A – SQA14C using a 1-4 scale.
- **SA_SINT_CURR** – Single item scale measuring students’ situational interest in mathematics, based on their current year teacher, as recorded in SQA, based on SQA14D.
- **SA_GENSELF EFF_CURR** – Scale measuring students’ general self-efficacy in mathematics, based on their current year teacher, as recorded in SQA, standardized using the average of country-specific means and standard deviations. Calculated as the mean of SQA15A – SQA15E using a 1-4 scale.
- **SA_OTL** – Scale measuring student perception of overall opportunity to learn mathematical tasks in general, calculated as the total of SQA16A1 – SQA16J1.
- **SA_EFFICACY** – Scale measuring student self-efficacy with mathematical tasks in general, calculated as the mean of SQA16A2 – SQA16J2.
- **SA_USECONT** – Scale measuring the student’s use of content-related structure during mathematics instruction, calculated as the mean of SQA17A – SQA17C.

- **SA_USECOGACT** – Scale measuring the student’s actual cognitive engagement in mathematics class, calculated as the mean of SQA17D – SQA17F.
- **SA_USESELFDDET** – Scale measuring the student’s experience of autonomy, competence, and social relatedness during mathematics instruction, calculated as the mean of SQA17G – SQA17I.
- **SA_USETOT** – Scale measuring the student’s use of time on task, calculated as the mean of SQA17J – SQA17L.
- **SA_CLARITY** – Scale measuring student perception of clarity of instruction during the unit on quadratic equations, calculated as the mean of SQA18A – SQA18D.
- **SA_COGACT** – Scale measuring student perception of the teacher's ability to elicit cognitive activation during the unit on quadratic equations, calculated as the mean of SQA18E – SQA18H.
- **SA_DISCOURSE** – Scale measuring student perception of the teacher's use of discourse in mathematics in general, calculated as the mean of SQA18I – SQA18K.
- **SA_ADAPT** – Scale measuring student perception of the teacher's adaptation of instruction to student needs in mathematics in general, calculated as the mean of SQA19A – SQA19E.
- **SA_CLASSMAN** – Scale measuring student perception of the teacher's level of classroom management in mathematics in general, calculated as the mean of SQA20A – SQA20J.
- **SA_CM_DISRUPT** – Scale measuring student perception of classroom disruptions and teacher's reaction to them. Calculated as the mean of SQA20A – SQA20C.
- **SA_CM_TEACHMAN** – Scale measuring student perception of teacher’s management of classroom disruptions. Calculated as the mean of SQA20F, SQA20G, SQA20I, and SQA20J.
- **SA_TESUP** – Scale measuring student perception of teacher support in mathematics in general, calculated as the mean of SQA21A – SQA21C.
- **SA_SUPCOM** – Scale measuring student perception of teacher support for competence in mathematics in general, calculated as the mean of SQA21D – SQA21G.
- **SA_SUPAUT** – Scale measuring student perception of teacher support for autonomy in mathematics in general, calculated as the mean of SQA21H – SQA21K.
- **SA_REL_STUDTEACH** – Scale measuring student perception of student-teacher relationship, calculated as the mean of SQA22A – SQA22E.
- **SA_REL_STUDSTUD** – Scale measuring student perception of student-student relationships, calculated as the mean of SQA22F – SQA22I.
- **SA_TESTDIFF** – Single item scale measuring student perception of the difficulty of the pre-test, calculated based on SQA24.
- **SA_TESTMOT** – Single item scale measuring student motivation on the pre-test, calculated based on SQA24.
- **SA_TESTASP** – Single item scale measuring student aspiration on the pre-test, calculated based on SQA26.
- **SA_PARED*** – Derived variable for parents’ education, based on Annex D of PISA 2015 Technical Report. Our variable derivation is mostly consistent with PISA 2015, but harmonization was required to resolve inconsistencies across countries/economies. See Table 1.9.2 for harmonization rules. This variable is calculated as the maximum of the

mother's and father's highest level of education, converted from ISCED level (harmonized across countries – see Table 1.9.3) to years of schooling (differing by country). If information for one parent is missing, we base SA_PARED on the parent with non-missing data. The calculation steps are summarised below:

1. Harmonize conversion of questionnaire responses to ISCED levels
 2. Convert ISCED levels to years of schooling by country/economy
 3. Determine years of schooling for father and mother
 4. Take maximum of years of schooling for father and mother
- **SA_HOMEPOS_IRT*** – Derived variable for students' home possessions using an IRT graded response model.
 - **SA_NUMQMISS** – Derived variable that counts the number of questionnaire items with missing responses for the student.
 - **SB_SELFCON** – Scale measuring student self-concept during the unit on quadratic equations, calculated as the mean of SQB01A – SQB01F.
 - **SB_SINT_CURR** – Single item scale measuring students' situational interest in mathematics, based on their current year teacher, as recorded in SQB, based on SQB03D.
 - **SB_LOSSINST** – Single item scale measuring loss of individual learning time during the unit on quadratic equations, based on SQB04.
 - **SB_OUT_ASSIGNSELF** – Single item scale measuring average hours per week spent on assigned, self-controlled out of school learning on quadratic equations, based on SQB05A.
 - **SB_OUT_ASSIGNSUP** – Single item scale measuring average hours per week spent on assigned, supervised out of school learning on quadratic equations, based on SQB05B.
 - **SB_OUT_ADD** – Single item scale measuring average hours per week spent on additional out of school study on quadratic equations, based on SQB05C.
 - **SB_OUT_OTHER** – Single item scale measuring average hours per week spent on other subjects, based on SQB05D.
 - **SB_OUT_TOTAL** – Scale measuring total number of average hours per week spent on out of school learning on quadratic equations, calculated as the total of SQB05A, SQB05B, and SQB05C.
 - **SB_USECONT** – Scale measuring the student's use of content-related structure during mathematics instruction during the unit on quadratic equations, calculated as the mean of SQB06A – SQB06C.
 - **SB_USECOGACT** – Scale measuring the student's actual cognitive engagement in mathematics class during the unit on quadratic equations, calculated as the mean of SQB06D – SQB06F.
 - **SB_USESELFDDET** – Scale measuring the student's experience of autonomy, competence, and social relatedness during mathematics instruction during the unit on quadratic equations, calculated as the mean of SQB06G – SQB06I.
 - **SB_USETOT** – Scale measuring the student's use of time on task during the unit on quadratic equations, calculated as the mean of SQB06J – SQB06L.
 - **SB_OTL** – Scale measuring student perception of overall opportunity to learn during the unit on quadratic equations, calculated as the mean of SQB07EA – SQB07EK.
 - **SB_OTL_FUNCTION** – Scale measuring student perception of opportunity to use quadratic functions. Calculated as the sum of SQB07EA and SQB07EK.

- **SB_OTL_ALGEBRA** – Scale measuring student perception of opportunity to learn algebraic operations. Calculated as the sum of SQB07EB – SQB07EF.
- **SB_OTL_REASON** – Scale measuring student perception of opportunity to learn reasoning about different types of quadratic equations. Calculated as the sum of SQB07EG and SQB07EH.
- **SB_OTL_APPLIED** – Scale measuring student perception of opportunity to apply quadratic equations to real world contexts. Calculated as the sum of SQB07EI and SQB07EJ.
- **SB_EFFICACY** – Scale measuring student self-efficacy with mathematical tasks during the unit on quadratic equations, calculated as the mean of SQB07CA – SQB07CK.
- **SB_CLARITY** – Scale measuring student perception of clarity of instruction during the unit on quadratic equations, calculated as the mean of SQB08A – SQB08D.
- **SB_COGACT** – Scale measuring student perception of teacher's ability to elicit cognitive activation during the unit on quadratic equations, calculated as the mean of SQB08E – SQB08H.
- **SB_CE_COGACT** – Scale measuring student perception of teacher's ability to elicit cognitive activation in mathematics class, but a subscale of SB_COGACT excluding item SQB08F. Calculated as the mean of SQB08E, SQB08G, SQB08H.
- **SB_DISCOURSE** – Scale measuring student perception of teacher's use of discourse during the unit on quadratic equations, calculated as the mean of SQB08I – SQB08K.
- **SB_MEANING** – Scale measuring student perception of teacher's focus on meaning during the unit on quadratic equations, calculated as the mean of SQB09A – SQB09D.
- **SB_EXPL_PROC** – Scale measuring student perception of teacher's focus on explaining procedures during the unit on quadratic equations, calculated as the mean of SQB09A – SQB09C.
- **SB_ADAPT** – Scale measuring student perception of teacher's adaptation of instruction to student needs during the unit on quadratic equations, calculated as the mean of SQB10A – SQB10E.
- **SB_CLASSMAN** – Scale measuring student perception of teacher's level of classroom management during the unit on quadratic equations, calculated as the mean of SQB11A – SQB11J.
- **SB_CM_DISRUPT** – Scale measuring student perception of classroom disruptions and teacher's reaction to them. Calculated as the mean of SQB11A – SQB11C.
- **SB_CM_TEACHMAN** – Scale measuring student perception of teacher's management of classroom disruptions. Calculated as the mean of SQB11F, SQB11G, SQB11I, and SQB11J.
- **SB_TESUP** – Scale measuring student perception of teacher support during the unit on quadratic equations, calculated as the mean of SQB12A – SQB12C.
- **SB_SUPCOM** – Scale measuring student perception of teacher support for competence during the unit on quadratic equations, calculated as the mean of SQB12D – SQB12G.
- **SB_SUPAUT** – Scale measuring student perception of the teacher's support for autonomy during the unit on quadratic equations, calculated as the mean of SQB12H – SQB12K.
- **SB_REL_STUDTEACH** – Scale measuring student perception of student-teacher relationship, calculated as the mean of SQB13A – SQB13E.

- **SB_REL_STUDSTUD** – Scale measuring student perception of student-student relationships, calculated as the mean of SQB13F – SQB13I.
- **SB_EXPECT** – Scale measuring student perception of high expectations for students, calculated as the mean of SQB14A – SQB14D.
- **SB_ASSESS_CHECK**– Single item scale measuring whether the teacher assessed student learning by having individual students answer questions in front of the class during the unit on quadratic equations, based on SQB15A.
- **SB_ASSESS_SELFEV**– Single item scale measuring whether the teacher assessed student learning by student self-evaluation during the unit on quadratic equations, based on SQB15B.
- **SB_ASSESS_OBS** – Single item scale measuring whether the teacher assessed student learning by teacher observation during the unit on quadratic equations, based on SQB15C.
- **SB_FEEDBACK** – Scale measuring student perception of level of feedback received from teacher. Calculated as the mean of SQB16A – SQB16D.
- **SB_TEACHENTHUS** – Scale measuring student perception of teacher enthusiasm, calculated as the mean of SQB17A – SQB17H.
- **SB_REACTIVITY_TEACH** – Derived variable for student perception of the teacher’s reactivity to videographing, calculated as the mean of SQB18A – SQB18G.
- **SB_REACTIVITY_STUD** – Derived variable for the student’s reactivity to videographing, calculated as the mean of SQB18H – SQB18K.
- **SB_TESTDIFF** – Single item scale measuring student perception of the difficulty of the post-test, calculated based on SQB19.
- **SB_TESTMOT** – Single item scale measuring student motivation on the post-test, calculated based on SQB20.
- **SB_TESTASP** – Single item scale measuring student aspiration on the post-test, calculated based on SQB21.
- **SB_NUMQMISS** – Derived variable for the number of questions with missing responses.
- **STA_SCOREXX** – Derived indicator for whether the student answered pretest question XX correctly, where “XX” takes on the values 01 through 30. Calculated as $STA_SCOREXX=1$ if the response to STAXX is correct, and $STA_SCOREXX=0$ otherwise.
- **STA_FEIWITEMS** – Derived indicator for whether the student answered five or fewer items on the pretest. Calculated as $STA_FEIWITEMS=1$ if $STA_NMISS \geq 25$, and $STA_FEIWITEMS=0$ otherwise.
- **STA_NMISS** – Derived variable for number of missing responses to the pretest. Calculated as the number of missing items of STA01 – STA30.
- **STA_IRTSCORE** – Derived variable for pretest IRT score (weight likelihood estimate) from a multi-group IRT model.
- **STA_SE_IRTSCORE** – Derived variable for standard error (SE) for pretest IRT score.
- **STA_TOTALSCORE** – Derived variable for total pretest score. Calculated as the sum of all STA_SCOREXX values.
- **STA_PROPCORRECTSCORE** – Derived variable for proportion of pretest questions answered correctly. Calculated as $STA_TOTALSCORE / 30$.

- **STA_NOTE** – Note about whether any items were excluded from the pretest scores (IRT score, total score, proportion correct score).
- **STB_SCOREXX** – Derived indicator for whether the student answered posttest question XX correctly, where “XX” takes on the values 01 through 25. Calculated as STB_SCOREXX=1 if the response to STBXX is correct, and STB_SCOREXX=0 otherwise.
- **STB_FEWITEMS** – Derived indicator for whether the student answered five or fewer items on the posttest. Calculated as STB_FEWITEMS=1 if STB_NMISS \geq 20, and STB_FEWITEMS=0 otherwise.
- **STB_NMISS** – Derived variable for number of missing responses to the posttest. Calculated as the number of missing items of STB01 – STB25.
- **STB_IRTSCORE** – Derived variable for posttest IRT score (weight likelihood estimate) from multi-group IRT model.
- **STB_SE_IRTSCORE** – Derived variable for standard error (SE) for posttest IRT score.
- **STB_TOTALSCORE** – Derived variable for total posttest score. Calculated as the sum of all STB_SCOREXX values, excluding item 20. Item 20 was excluded from the posttest scores due to poor performance across several countries/economies.
- **STB_PROPCORRECTSCORE** – Derived variable for proportion of retained posttest questions answered correctly (excludes item 20). Calculated as STB_TOTALSCORE / 24.
- **STB_NOTE** – Note about whether any items were excluded from the posttest scores (IRT score, total score, proportion correct score). One item (item 20) was excluded from the posttest scores due to poor performance across several countries/economies.
- **CLASS_PRE_PINT*** – Derived variable for the average of PRE_PINT for all students in the class, excluding the individual student.
- **CLASS_PRE_GENSELF EFF*** – Derived variable for the average of PRE_GENSELF EFF for all students in the class, excluding the individual student.
- **CLASS_PRE_TEST*** – Derived variable for the average of PRE_TEST for all students in the class, excluding the individual student.
- **CLASS_SA_IMMIG_I*** – Derived variable for the average of SA_IMMIG_I for all students in the class, excluding the individual student.
- **CLASS_SA_FEMALE*** – Derived variable for the average of SA_FEMALE for all students in the class, excluding the individual student.
- **CLASS_SA_PARED*** – Derived variable for the average of SA_PARED for all students in the class, excluding the individual student.
- **CLASS_SA_HOMEPOS_IRT*** – Derived variable for the average of SA_HOMEPOS_IRT for all students in the class, excluding the individual student.
- **PRE_PINT*** – Derived variable for students’ personal interest in mathematics, based on their previous year teacher, as recorded in SQA. Calculated as the mean of SQA12A – SQA12C using a 1-4 scale.
- **PRE_GENSELF EFF*** – Derived variable for students’ general self-efficacy in mathematics, based on their previous year teacher, as recorded in SQA. Calculated as the mean of SQA13A – SQA13E using a 1-4 scale.
- **PRE_TEST*** – Standardized form of STA_IRTSCORE, standardized using the average of country-specific means and standard deviations. This measure uses a 100-300 scale,

with 200 representing the average pre-test score across all countries in the sample with a standard deviation of 25 points.

- **POST_GENSELF EFF*** – Derived variable for students’ general self-efficacy in mathematics, based on their current year teacher, as recorded in SQB. Calculated as the mean of SQB02A – SQB02E using a 1-4 scale.
- **POST_PINT*** – Derived variable for students’ personal interest in mathematics, based on their current year teacher, as recorded in SQB. Calculated as the mean of SQB03A – SQB03C using a 1-4 scale.
- **POST_TEST*** – Standardized form of STB_IRTSCORE, standardized using the average of country-specific means and standard deviations. This measure uses a 100-300 scale, with 200 representing the average post-test score across all countries in the sample with a standard deviation of 25 points.

5.4 Teacher file variables

The teacher-level file contains data from the teacher pre-questionnaire, teacher post-questionnaire, and teacher logs, as well as derived variables from the video indicator, video component, and artefact datasets that are used in the analysis. Each observation in the dataset (which is one row in the file) includes all data collected from these instruments for one teacher.

The teacher pre-questionnaire variables include teaching practices, teaching values, perceptions of classroom atmosphere, perceptions of limitations, personal relationship with teaching, job satisfaction, and time commitment to teaching.

The teacher post-questionnaire variables include education, qualification, experience, teaching practices specifically relating to the lesson on quadratic equations, perceptions of classroom atmosphere during the quadratic equations unit, emotional state during the quadratic equations unit, reactivity to filming, and content knowledge.

Derived variables from the teacher questionnaires in the teacher-level file include the following:

- **TA_SELF EFF** – Scale measuring the teacher’s perceived self-efficacy. Calculated as the mean of TQA11A – TQA11L if at least six of these values are nonmissing, and missing otherwise.
- **TA_LOADTEACH** – Single item scale measuring the teacher’s workload teaching mathematics to the target class, based on TQA01A.
- **TA_LOADPREP** – Single item scale measuring the teacher’s workload preparing to teach mathematics to the target class, based on TQA01B.
- **TA_LOADOTHER** – Single item scale measuring the teacher’s workload teaching the target class in other (non-mathematics) subjects, based on TQA01C.
- **TA_LESSDUR** – Single item scale measuring the duration of a mathematics lesson in general, based on TQA02.
- **TA_OTL** – Scale measuring opportunity-to-learn for mathematical tasks, focusing on prerequisites necessary for the understanding of quadratic equations, calculated as the total of TQA03A – TQA03E.
- **TA_CLARITY** – Scale measuring the teacher’s perception of clarity instruction when teaching the target class in mathematics, calculated as the mean of TQA04A – TQA04D.

- **TA_COGACT** – Scale measuring the teacher’s perception of cognitive activation of the target class in mathematics, calculated as the mean of TQA04E – TQA04H.
- **TA_DISCOURSE** – Scale measuring the teacher’s perception of discourse in the target class in mathematics, calculated as the mean of TQA04I – TQA04K.
- **TA_MEANING** – Scale measuring the teacher’s perception of focus on meaning in the target class in mathematics, calculated as the mean of TQA05A – TQA05D.
- **TA_ADAPT** – Scale measuring the teacher’s perception of adaption of instruction to student understanding in the target class in mathematics, calculated as the mean of TQA06A – TQA06E.
- **TA_CLASSMAN** – Scale measuring the teacher’s perception of classroom management in the target class in mathematics, calculated as the mean of TQA07A – TQA07J.
- **TA_CM_DISRUPT** – Scale measuring the teacher’s perception of classroom disruptions in the target class in mathematics, calculated as the mean of TQA07A – TQA07C.
- **TA_CM_TEACHMAN** – Scale measuring the teacher’s perception of the teacher’s management of classroom disruptions, calculated as the mean of TQA07F, TQA07G, TQA07I, and TQA07J.
- **TA_TESUP** – Scale measuring the teacher’s perception of teacher support in the target class in mathematics, calculated as the mean of TQA08A – TQ08C.
- **TA_SUPCOM** – Scale measuring the teacher’s perception of support for competence in the target class in mathematics, calculated as the mean of TQA08D – TQ08G.
- **TA_SUPAUT** – Scale measuring the teacher’s perception of support for autonomy in the target class in mathematics, calculated as the mean of TQA08H – TQ08K.
- **TA_REL_STUDTEACH** – Scale measuring the teacher’s perception of student-teacher relationships in the target class in mathematics, calculated as the mean of TQA09A – TQ09E.
- **TA_TEACHER_ENTHUSIASM** – Scale measuring teacher enthusiasm, calculated as the mean of TQA10A – TQA10H.
- **TA_ENTHUSTEACH** – Scale measuring the teacher's enthusiasm for teaching the target class in mathematics, calculated as the mean of TQA10A – TQA10D.
- **TA_ENTHUSMATH** – Scale measuring the teacher's enthusiasm for the subject of mathematics, calculated as the mean of TQA10E – TQA10H.
- **TA_SELFEFF_CLASSMAN** – Scale measuring the teacher’s perceived self-efficacy in classroom management in teaching mathematics in the target class, calculated as the mean of TQA11D, TQA11F, TQA11H, and TQA11I.
- **TA_SELFEFF_INST** – Scale measuring the teacher’s perceived self-efficacy in instruction in teaching mathematics in the target class, calculated as the mean of TQA11C, TQA11J, TQA11K, and TQA11L.
- **TA_SELFEFF_ENG** – Scale measuring the teacher’s perceived self-efficacy in student engagement in teaching mathematics in the target class, calculated as the mean of TQA11A, TQA11B, TQA11E, and TQA11G.
- **TA_ENJOY** – Scale measuring the teacher’s enjoyment when teaching mathematics in the target class, calculated as the mean of TQA12A, TQA12J, TQA12L, and TQA12I.
- **TA_ANGER** – Scale measuring the teacher’s anger when teaching mathematics in the target class, calculated as the mean of TQA12B, TQA12C, TQA12K, and TQA12G.

- **TA_ANXIETY** – Scale measuring the teacher’s anxiety when teaching mathematics in the target class, calculated as the mean of TQA12D, TQA12E, TQA12F, and TQA12H.
- **TA_IMP MOT** – Derived variable for the importance of the goal of motivation for the unit on quadratic equations, calculated as the total of TQA13A, TQA13B, TQA13C, and TQA13D.
- **TA_IMP VAL** – Derived variable for the importance of the goal of values for the unit on quadratic equations, calculated as the total of TQA13D, TQA13E, TQA13H, and TQA13G.
- **TA_IMP APP** – Derived variable for the importance of the goal of application for the unit on quadratic equations, calculated as the total of TQA13C, TQA13G, TQA13H, and TQA13I.
- **TA_IMP TR** – Derived variable for the importance of the goal of thinking for the unit on quadratic equations, calculated as the total of TQA13B, TQA13F, TQA13H, and TQA13J.
- **TA_IMP KS** – Derived variable for the importance of the goal of knowledge for the unit on quadratic equations, calculated as the total of TQA13A, TQA13E, TQA13I, and TQA13J.
- **TA_LIMITATIONS** – Scale measuring the extent to which the teacher believes that student background factors hinder instruction, calculated as the mean of TQA14A – TQA14G.
- **TA_RESPONSIBILITY** – Scale measuring the teacher’s feeling of responsibility for teaching and for student motivation and achievement, calculated as the mean of TQA15A – TQA15I.
- **TA_RESP MOT** – Scale measuring the teacher’s feeling of responsibility for student motivation, calculated as the mean of TQA15I, TQA15E, and TQA15D.
- **TA_RESP ACHIEV** – Scale measuring the teacher’s feeling of responsibility for student achievement, calculated as the mean of TQA15A, TQA15B, and TQA15C.
- **TA_RESP TEACH** – Scale measuring the teacher’s feeling of responsibility for teaching, calculated as the mean of TQA15F, TQA15G, and TQA15H.
- **TA_GENSELF EFF** – Scale measuring the teacher’s general feelings of self-efficacy, calculated as the mean of TQA16A – TQA16F.
- **TA_GENSELF EFF_CLASSMAN** – Scale measuring the teacher’s self-efficacy in classroom management in general, calculated as the mean of TQA16D and TQA16E.
- **TA_GENSELF EFF_INST** – Scale measuring the teacher’s self-efficacy in instruction in general, calculated as the mean of TQA16C and TQA16F.
- **TA_GENSELF EFF_ENG** – Scale measuring the teacher’s self-efficacy in student engagement in general, calculated as the mean of TQA16A and TQA16B.
- **TA_CONBELIEFS** – Scale measuring the extent to which the teacher holds constructivist beliefs, calculated as the mean of TQA17A – TQA17D.
- **TA_COLLAB** – Scale measuring teacher collaboration, calculated as the mean of TQA18A – TQA18D.
- **TA_AUTONOMY** – Scale measuring classroom autonomy, calculated as the mean of TQA19A – TQA19F.
- **TA_FREQUVID** – Single item scale measuring the frequency of being videotaped, based on TQA20.

- **TA_FREQOBS_YEAR** – Single item scale measuring the frequency of being observed in a typical school year, based on TQA21A.
- **TA_FREQVID_YEAR** – Single item scale measuring the frequency of being videotaped in a typical school year, based on TQA21B.
- **TA_JOB_SATISFACTION** – Scale measuring the teacher’s overall job satisfaction, calculated as the mean of TQA22A – TQA22J.
- **TA_SATSCHOOL** – Scale measuring the teacher’s job satisfaction regarding the specific school, calculated as the mean of TQA22C, TQA22E, TQA22G, and TQA22I.
- **TA_SATPROF** – Scale measuring the teacher’s job satisfaction regarding the profession, calculated as the mean of TQA22A, TQA22B, TQA22D, TQA22F, TQA22H, and TQA22J.
- **TA_EXPL_PROC** – Scale measuring teacher perception of the teacher’s focus on explaining procedures during the unit on quadratic equations, calculated as the mean of TQA05A – TQA05C.
- **TQB22_X_SCORE** – Derived indicator for whether the response to post-questionnaire question 22_X is correct. The correct answers to parts 1-4 are: 3, 3, 2, 1, respectively. Thus, if TQB22_1==3, then TQB22_1_SCORE=1; if TQB22_2==3, then TQB22_2_SCORE=1; if TQB22_3==2, then TQB22_3_SCORE=1; if TQB22_4==1, then TQB22_4_SCORE=1. Otherwise, TQB22_X_SCORE = 0 or 9999 (missing).
- **TB_FEMALE** – Derived indicator for teachers identifying as female. Calculated as 1 if TQB01=1, and 0 otherwise.
- **TB_QUALIFICATION** – Single item scale measuring the teacher’s highest level of formal qualification. Combines separate binary indicators for teacher’s qualification into a categorical variable. Takes on the value of TQB03, after recoding (see harmonization rules in Table 1.9.4).
- **TB_QUAL_TECHSCHL** – Single item indicator for whether the teacher’s highest level of education attained is a technical degree. Calculated as 1 if TQB03=2, and 0 otherwise, after recoding (see harmonization rules in Table 1.9.4).
- **TB_QUAL_UNDERGRAD** – Single item indicator for whether the teacher’s highest level of education attained is an undergraduate degree. Calculated as 1 if TQB03=3, and 0 otherwise, after recoding (see harmonization rules in Table 1.9.4).
- **TB_QUAL_MASTERS** – Single item indicator for whether the teacher’s highest level of education attained is a masters’ degree. Calculated as 1 if TQB03=4, and 0 otherwise, after recoding (see harmonization rules in Table 1.9.4).
- **TB_QUAL_DOCTORATE** – Single item indicator for whether the teacher’s highest level of education attained is a doctorate degree. Calculated as 1 if TQB03=5, and 0 otherwise, after recoding (see harmonization rules in Table 1.9.4).
- **TB_TEACHQUAL** – Single item scale measuring how the teacher received his or her teaching qualifications. Takes on the value of TQB04, after recoding (see harmonization rules in Table 1.9.4).
- **TB_OTT1** – Derived indicator for whether the teacher was trained through standard, in-service, or work-based teacher training (originally trained teacher – strict definition).

Calculated as 1 if TQB_04=2 in all countries/economies except for Germany*, 1 if TQB04=1 in Germany*, and 0 otherwise.⁷

- **TB_OTT2** – Derived indicator for whether the teacher was trained through standard teacher training (originally trained teacher – wide definition). Calculated as 1 if TQB_04 = (2 or 3 or 4) in all countries/economies except for Germany*, 1 if TQB04 = 1 in Germany*, and 0 otherwise.⁸
- **TB_TEACHQUAL_1** – Derived indicator for whether the teacher received his or her teaching qualifications through a standard teacher education or training program at an educational institute which is eligible to train or educate teachers. Calculated as 1 if TQB04=1, and 0 otherwise, after recoding (see harmonization rules in Table 1.9.4).
- **TB_TEACHQUAL_2** – Derived indicator for whether the teacher received his or her teaching qualifications by attending an in-service teacher education or training program. Calculated as 1 if TQB04=2, and 0 otherwise, after recoding (see harmonization rules in Table 1.9.4).
- **TB_TEACHQUAL_3** – Derived indicator for whether the teacher received his or her teaching qualifications by attending a work-based teacher education or training program. Calculated as 1 if TQB_04=3, and 0 otherwise, after recoding (see harmonization rules in Table 1.9.4).
- **TB_TEACHQUAL_4** – Derived indicator for whether the teacher received his or her teaching qualifications through training in another pedagogical profession. Calculated as 1 if TQB04=4, and 0 otherwise, after recoding (see harmonization rules in Table 1.9.4).
- **TB_TEACHQUAL_5** – Derived indicator for whether the teacher received his or her teaching qualifications through means not covered in TB_TEACHQUAL_1 – TB_TEACHQUAL_4. Calculated as 1 if TQB04=5, and 0 otherwise, after recoding (see harmonization rules in Table 1.9.4).
- **TB_EDUMATH** – Single item indicator for whether the teacher’s mathematics education or training included mathematics courses equivalent to those required for a degree in mathematics. Takes on the value of TQB05A.
- **TB_EDUTEACH** – Single item indicator for whether the teacher’s mathematics education or training included courses on how to teach mathematics. Takes on the value of TQB05B, after recoding.
- **TB_EDUPRACT** – Single item indicator for whether the teacher’s mathematics education or training included practice teaching mathematics. Takes on the value of TQB05C, after recoding.
- **TB_WORKEXP** – Single item scale measuring work experience of the teacher. Takes on the value of TQB06.
- **TB_PLANTIME_V1** – Single item scale measuring the number of minutes teacher spent planning for the first videotaped lesson, based on TQB07A.

⁷ In practice, we calculated this by first recoding TQB04 as 2 → 1, 3 → 2, 4 → 3, 5 → 4, 6 → 5 for all countries and economies excluding Germany*, then setting to 1 if TQB04=1.

⁸ In practice, we calculated this by first recoding TQB04 as 2 → 1, 3 → 2, 4 → 3, 5 → 4, 6 → 5 for all countries and economies, excluding Germany*, then setting to 1 if TQB04 = (1 or 2 or 3).

- **TB_PLANTIME_V2** – Single item scale measuring the number of minutes teacher spent planning for the second videotaped lesson, based on TQB07B.
- **TB_CLARITY** – Scale measuring the teacher’s perception of clarity instruction when teaching the target class in mathematics during the unit on quadratic equations, calculated as the mean of TQB08A – TQB08D.
- **TB_COGACT** – Scale measuring the teacher’s perception of cognitive activation of the target class in mathematics during the unit on quadratic equations, calculated as the mean of TQB08E – TQB08H.
- **TB_DISCOURSE** – Scale measuring the teacher’s perception of discourse in the target class in mathematics during the unit on quadratic equations, calculated as the mean of TQB08I – TQB08K.
- **TB_EXPL_PROC** – Scale measuring teacher perception of the teacher’s focus on explaining procedures during the unit on quadratic equations, calculated as the mean of TQB09A – TQB09C.
- **TB_MEANING** – Scale measuring the teacher’s perception of focus on meaning in the target class in mathematics during the lessons on quadratic equations, calculated as the mean of TQB09A – TQB09D.
- **TB_ADAPT** – Scale measuring the teacher’s perception of adaption of instruction to student understanding in the target class in mathematics during the lessons on quadratic equations, calculated as the mean of TQB10A – TQB10E.
- **TB_CLASSMAN** – Scale measuring the teacher’s perception of classroom management in the target class in mathematics during the lessons on quadratic equations, calculated as the mean of TQB11A – TQB11J.
- **TB_CM_TEACHMAN** – Scale measuring the teacher’s perception of the teacher’s management of classroom disruptions, calculated as the mean of TQB11F, TQB11G, TQB11I, and TQB11J.
- **TB_TESUP** – Scale measuring the teacher’s perception of teacher support in the target class in mathematics during the lessons on quadratic equations, calculated as the mean of TQB12A – TQB12C.
- **TB_SUPCOM** – Scale measuring the teacher’s perception of support for competence in the target class in mathematics during the lessons on quadratic equations, calculated as the mean of TQB12D – TQB12G.
- **TB_SUPAUT** – Scale measuring the teacher’s perception of support for autonomy in the target class in mathematics during the lessons on quadratic equations, calculated as the mean of TQB12H – TQB12K.
- **TB_REL_STUDTEACH** – Scale measuring the teacher’s perception of student-teacher relationships in the target class in mathematics during the lessons on quadratic equations, calculated as the mean of TQB13A – TQB13E.
- **TB_CM_DISRUPT** – Scale measuring the teacher’s perception of classroom disruptions, calculated as the mean of TQB11A – TQB11C.
- **TB_ASSESS_OWN** – Single item scale measuring whether the teacher administered their own assessment of student learning during the unit on quadratic equations, based on TQB14A.

- **TB_ASSESS_CHECK** – Single item scale measuring whether the teacher assessed student learning by having individual students answer questions in front of the class during the unit on quadratic equations, based on TQB14B.
- **TB_ASSESS_SELFEV** – Single item scale measuring whether the teacher assessed student learning by student self-evaluation during the unit on quadratic equations, based on TQB14C.
- **TB_ASSESS_OBS** – Single item scale measuring whether the teacher assessed student learning by teacher observation during the unit on quadratic equations, based on TQB14D.
- **TB_HOMEWORK**– Single item scale measuring the frequency of homework assignments, based on TQB15.
- **TB_ENTHUSTEACH** – Scale measuring the teacher's enthusiasm for teaching the target class in mathematics during the unit on quadratic equations, calculated as the mean of TQB16A – TQB16D.
- **TB_SELFEFF** – Scale measuring the teacher's overall perceived self-efficacy in teaching mathematics in the target class during the unit on quadratic equations, calculated as the mean of TQB17A – TQB17L.
- **TB_SELFEFF_ENG** – Scale measuring the teacher's perceived self-efficacy in student engagement in teaching mathematics in the target class during the unit on quadratic equations, calculated as the mean of TQB17A, TQB17B, TQB17E, and TQB17G.
- **TB_SELFEFF_INST** – Scale measuring the teacher's perceived self-efficacy in instruction in teaching mathematics in the target class during the unit on quadratic equations, calculated as the mean of TQB17C, TQB17J, TQB17K, and TQB17L.
- **TB_SELFEFF_CLASSMAN** – Scale measuring the teacher's perceived self-efficacy in classroom management in teaching mathematics in the target class during the unit on quadratic equations, calculated as the mean of TQB17D, TQB17F, TQB17H, and TQB17I.
- **TB_ENJOY** – Scale measuring the teacher's enjoyment when teaching mathematics in the target class during the unit on quadratic equations, calculated as the mean of TQB18A, TQB18J, TQB18L, and TQB18I.
- **TB_ANGER** – Scale measuring the teacher's anger when teaching mathematics in the target class during the unit on quadratic equations, calculated as the mean of TQB18B, TQB18C, TQB18K, and TQB18G.
- **TB_ANXIETY** – Scale measuring the teacher's anxiety when teaching mathematics in the target class during the unit on quadratic equations, calculated as the mean of TQB18D, TQB18E, TQB18F, and TQB18H.
- **TB_REACTIVITY** – Derived variable for the teacher's reactivity to videographing, calculated as the mean of TQB19A – TQB19M.
- **TB_TYPVID1** – Single item scale measuring the teacher's perception of the typicality of the first videotaped lesson, based on TQB20A.
- **TB_TYPVID2** – Single item scale measuring the teacher's perception of the typicality of the second videotaped lesson, based on TQB20B.
- **TB_GOALACHIEV** – Derived variable for the teacher's perception of the achievement of the learning goals of the videotaped lessons and unit, calculated as the total of TQB21A – TQB21E.

- **TB_KNOWLEDGE** – Scale measuring the extent to which the teacher holds knowledge as it is used in practice, calculated as the total of TQB22_1_SCORE, TQB22_2_SCORE, TQB22_3_SCORE, and TQB22_4_SCORE
- **TB_DESIRABILITY** – Derived variable for the teacher’s perception of the social desirability of the teaching profession, calculated as the mean of TQB23A – TQB23D.
- **CLASS_SIZE_QUES** – Derived variable giving the size of the teacher’s class based on the number of students giving consent to the questionnaire.
- **CLASS_SIZE_TEST** – Derived variable giving the size of the teacher’s class based on the number of students giving consent to the test.
- **CLASS_SIZE_VIDEO** – Derived variable giving the size of the teacher’s class based on the number of students giving consent to the video.
- **CLASS_SIZE_FULL**⁹ – Derived variable giving the size of the teacher’s class based on the number of students recorded in the student sampling resolution.
- **CLASS_SIZE_ALL** – Derived variable giving the size of the teacher’s class based on the number of students giving consent to the questionnaire, test, and video.

Derived variables for subtopic coverage from the teacher log were calculated by taking the weighted sum of subtopic coverage ratings, where a lesson was counted with weight 1 if the subtopic was covered fully, weight 0.5 if the subtopic was covered to a minor extent, and weight 0 if the subtopic was not covered at all. These variables are defined as follows:

- **TL03_SUM** – Subtopic coverage rating for handling expressions.
- **TL04_SUM** – Subtopic coverage rating for binomial formulas.
- **TL05_SUM** – Subtopic coverage rating for introducing some type of quadratic equations.
- **TL06A_SUM** – Subtopic coverage rating for solving quadratic equations by completing the square.
- **TL06B_SUM** – Subtopic coverage rating for solving quadratic equations by factorizing.
- **TL06C_SUM** – Subtopic coverage rating for solving quadratic equations using the quadratic formula.
- **TL06D_SUM** – Subtopic coverage rating for solving quadratic equations by graphical representation.
- **TL07_SUM** – Subtopic coverage rating for discussing different cases of quadratic equations.
- **TL08_SUM** – Subtopic coverage rating for quadratic functions.
- **TL09_SUM** – Subtopic coverage rating for applications.

Derived variables also include indices for opportunity to learn (OTL). There are three versions of each index: one based on teacher log responses, one based on student post-questionnaire responses, and one based on artefact ratings. These variables are named with a two- or three-part naming convention, indicating the type of index (OTL), the instrument the index is based on (TL, SQB, or AR), and the specific subtopic for the index (FUNCTIONS, REASONING, APPLIED, or ALGEBRA), if applicable. OTL_TL variables are defined as the weighted count of the lessons documented in the teacher log which cover the respective type of

⁹ This variable was also used in the regression analyses.

OTL. A lesson was counted with weight 1 if the subtopic was given major focus (score = 2), with weight 0.5 if the subtopic was given minor focus (score = 1), and with weight 0 otherwise. OTL_SQB variables are defined as class-level means of the variables related to each subtopic. Specifically, the OTL variables are defined as follows:

- **OTL_TL_FUNCTIONS** – Weighted index of OTL for using quadratic functions, based on the teacher log. Calculated as the weighted count of TL06D and TL08.
- **OTL_TL_ALGEBRA** – Weighted index of OTL for algebraic operations, based on the teacher log. Calculated as the weighted count of TL03, TL04, TL06A, TL06B, and TL06C.
- **OTL_TL_REASONING** – Weighted index of OTL for reasoning about different types of quadratic equations, based on the teacher log. Calculated as the weighted count of TL07.
- **OTL_TL_APPLIED** – Weighted index of OTL for applying quadratic equations to real world contexts, based on the teacher log. Calculated as the weighted count of TL09.
- **OTL_SQB** – Class-level mean for OTL related to the focal unit, based on the student post-questionnaire. Calculated as class-level mean of SQB07EA_rec – SQB07EK_rec.
- **OTL_SQB_FUNCTIONS** – Class-level mean for OTL for using quadratic functions, based on the student post-questionnaire. Calculated as class-level mean of SQB07EA_rec, SQB07EK_rec.
- **OTL_SQB_ALGEBRA** – Class-level mean for OTL for algebraic operations, based on the student post-questionnaire. Calculated as class-level mean of SQB07EB_rec, SQB07EC_rec, SQB07ED_rec, SQB07EE_rec, SQB07EF_rec.
- **OTL_SQB_REASONING** – Class-level mean for OTL for reasoning about different types of quadratic equations, based on the student post-questionnaire. Calculated as class-level mean of SQB07EG_rec, SQB07EH_rec.
- **OTL_SQB_APPLIED** – Class-level mean for OTL for applying quadratic equations to real world contexts, based on the student post-questionnaire. Calculated as class-level mean of SQB07EI_rec, SQB07_EJ_rec.
- **OTL_AR** – Summative index of OTL related to the focal unit, based on classroom artefact ratings. Calculated as mean of FACTOR_EXP_RATE – APPLY_REAL_WORLD_RATE.
- **OTL_AR_FUNCTIONS** – Summative index of OTL for using quadratic functions, based on classroom artefact ratings. Calculated as mean of SQE_FIND_ROOT_RATE, EXPLORING_FUNCT_RATE.
- **OTL_AR_ALGEBRA** – Summative index of OTL for algebraic operations, based on classroom artefact ratings. Calculated as mean of FACTOR_EXP_RATE, SQE_COMP_SQUARE_RATE, SQE_FACTORIZING_RATE, SQE_QUADRATIC_RATE.
- **OTL_AR_REASONING** – Summative index of OTL for reasoning about different types of quadratic equations, based on classroom artefact ratings. Calculated as mean of DIFF_CASE_RATE, EXAMINING_REL_RATE.
- **OTL_AR_APPLIED** – Summative index of OTL for applying quadratic equations to real world contexts, based on classroom artefact ratings. Takes on the value of APPLY_REAL_WORLD_RATE.

Derived variables from video and artefact data include teachers' scores for domains, components, and indicators (in the case of videos but not artefacts). Domain scores are averaged across components for the same domain, ratings for the same segment, segments for the same lesson, and then lessons for the same teacher. Typically, this means averaging across two ratings per segment, three to four segments per lesson, and two lessons per teacher. Our derived variables include abbreviated codes for the domains, components, and indicators, explained in the sections below.

Derived variables for video component scores take the form “**VCOMP_***component*,” where “*component*” is an alphanumeric code, composed of a two-letter code denoting the domain followed by a three-character code denoting the specific component:

Variable Name	Domain	Component
VCOMP_AR1ES	Assessment and Response to Student Understanding	Eliciting Student Feedback
VCOMP_AR2TF	Assessment and Response to Student Understanding	Teacher Feedback
VCOMP_AR3AI	Assessment and Response to Student Understanding	Aligning Instruction
VCOMP_CE1DS	Cognitive Engagement	Engagement in Cognitively Demanding Subject Matter
VCOMP_CE2MA	Cognitive Engagement	Multiple Approaches
VCOMP_CE3US	Cognitive Engagement	Understanding of Subject Matter
VCOMP_CM1RT	Classroom Management	Routines
VCOMP_CM2MN	Classroom Management	Monitoring
VCOMP_CM3DS	Classroom Management	Disruptions
VCOMP_DC1ND	Discourse	Nature of Discourse
VCOMP_DC2QT	Discourse	Questioning
VCOMP_DC3EP	Discourse	Explanations
VCOMP_QS1EC	Quality of Subject Matter	Explicit Connections
VCOMP_QS2PG	Quality of Subject Matter	Explicit Patterns and Generalizations
VCOMP_QS3CT	Quality of Subject Matter	Clarity
VCOMP_SE1RP	Social-Emotional Support	Respect
VCOMP_SE2EW	Social-Emotional Support	Encouragement and Warmth
VCOMP_SE3RT	Social-Emotional Support	Risk-taking
VCOMP_TOTC	Total	Total Component Score (Average of Individual Components)

Derived variables for video indicator scores take the form “**VIND_***indicator*,” where “*indicator*” is an alphanumeric code, composed of a two-letter code denoting the domain, a three-character code denoting the specific indicator, and a 3-6 letter code indicating the specific aggregation method used (**PCT, MAX, MIN, LESAVG, LESAVGNO1**¹⁰):

Variable Name	Domain	Indicator	Aggregation Method
VIND_CM1TTLES	Classroom Management	Time on Task	Average lesson rating for a teacher
VIND_SE2RPLES	Social-Emotional Support	Requests for Public Sharing	Average lesson rating for a teacher
VIND_QS1ELLES	Quality of Subject Matter	Explicit Learning Goals	Average lesson rating for a teacher
VIND_QS2ACLES	Quality of Subject Matter	Accuracy	Average lesson rating for a teacher
VIND_QS3RWLES	Quality of Subject Matter	Real-World Connections	Average lesson rating for a teacher
VIND_QS4CMLES	Quality of Subject Matter	Connecting Mathematical Topics	Average lesson rating for a teacher
VIND_QS11OPLES	Quality of Subject Matter	Organization of Procedural Instruction	Average lesson rating for a teacher
VIND_CE1MTLES	Cognitive Engagement	Metacognition	Average lesson rating for a teacher
VIND_SE1PSLESNO1	Social-Emotional Support	Persistence	Average lesson rating for a teacher when present
VIND_CE3TULESNO1	Cognitive Engagement	Technology for Understanding	Average lesson rating for a teacher when present
VIND_CM2AWPCT	Classroom Management	Activity: Whole Group	Average percentage of segments present
VIND_CM3ASPCT	Classroom Management	Activity: Small Group	Average percentage of segments present
VIND_CM4APPCT	Classroom Management	Activity: Pairs	Average percentage of segments present
VIND_CM5AIPCT	Classroom Management	Activity: Individual	Average percentage of segments present

¹⁰ PCT denotes the average percentage of segments the code is present (rating is greater than 1), averaged over raters and lessons; MAX denotes the average maximum rating for a teacher’s lessons, averaged over raters and lessons; MIN denotes the average minimum rating for a teacher’s lessons, averaged over raters and lessons ; LESAVG denotes the average lesson rating for a teacher; LESAVGNO1 denotes the average lesson rating for a teacher excluding cases where the rating is equal to 1, which denotes the code is not present.

VIND_SE1PSPCT	Social-Emotional Support	Persistence	Average percentage of segments present
VIND_QS6RGPCT	Quality of Subject Matter	Types of Representations: Graphs	Average percentage of segments present
VIND_QS7RTPCT	Quality of Subject Matter	Types of Representations: Tables	Average percentage of segments present
VIND_QS8RDPCT	Quality of Subject Matter	Types of Representations: Drawings	Average percentage of segments present
VIND_QS9REPCT	Quality of Subject Matter	Types of Representations: Equations	Average percentage of segments present
VIND_QS10ROPCT	Quality of Subject Matter	Types of Representations: Objects	Average percentage of segments present
VIND_CE3TUPCT	Cognitive Engagement	Technology for Understanding	Average percentage of segments present
VIND_CEXCT1PCT	Cognitive Engagement	Class Tech - Overhead Projector	Average percentage of segments present
VIND_CEXCT2PCT	Cognitive Engagement	Class Tech - Smartboard	Average percentage of segments present
VIND_CEXCT3PCT	Cognitive Engagement	Class Tech - Graphing Calculator	Average percentage of segments present
VIND_CEXCT4PCT	Cognitive Engagement	Class Tech - Non-Graphing Calculator	Average percentage of segments present
VIND_CEXCT5PCT	Cognitive Engagement	Class Tech - Computer Laptop	Average percentage of segments present
VIND_CEXCT6PCT	Cognitive Engagement	Class Tech - Television	Average percentage of segments present
VIND_CEXCT7PCT	Cognitive Engagement	Class Tech - Tablet	Average percentage of segments present
VIND_CEXCT8PCT	Cognitive Engagement	Class Tech - Cell Phone	Average percentage of segments present
VIND_CEXCT9PCT	Cognitive Engagement	Class Tech - None	Average percentage of segments present
VIND_CEXST3PCT	Cognitive Engagement	Student Tech - Graphing Calculator	Average percentage of segments present
VIND_CEXST4PCT	Cognitive Engagement	Student Tech - Non-Graphing Calculator	Average percentage of segments present
VIND_CEXST5PCT	Cognitive Engagement	Student Tech - Computer	Average percentage of segments present

VIND_CEXST7PCT	Cognitive Engagement	Student Tech - Tablet	Average percentage of segments present
VIND_CEXST8PCT	Cognitive Engagement	Student Tech - Cell Phone	Average percentage of segments present
VIND_CEXST9PCT	Cognitive Engagement	Student Tech - None	Average percentage of segments present
VIND_DC1DOMAX	Discourse	Discussing Opportunities	Average maximum rating
VIND_QS3RWMAX	Quality of Subject Matter	Real-World Connections	Average maximum rating
VIND_QS4CMMAX	Quality of Subject Matter	Connecting Mathematical Topics	Average maximum rating
VIND_QS5MSMAX	Quality of Subject Matter	Mathematical Summary	Average maximum rating
VIND_CE1MTMAX	Cognitive Engagement	Metacognition	Average maximum rating
VIND_CE2RUMAX	Cognitive Engagement	Repetitive Use Opportunities	Average maximum rating
VIND_CE10SUMAX	Cognitive Engagement	Software Use for Learning	Average maximum rating
VIND_QS2ACMIN	Quality of Subject Matter	Accuracy	Average minimum rating

Derived variables for artefact component scores take the form “**ACOMP_***component*,” where “*component*” is an alphabetic code denoting the component.

Variable Name	Domain	Component
ACOMP_CONN	Quality of Subject Matter	Mathematical connections
ACOMP_EXPPATR	Quality of Subject Matter	Patterns & generalizations
ACOMP_REAL	Quality of Subject Matter	Real-world connections
ACOMP_ASKING	Discourse	Questioning & explaining
ACOMP_MUL	Cognitive Engagement	Use & compare multiple mathematical approaches
ACOMP_EXPLEARN	Quality of Subject Matter	Plans & learning goals
ACOMP_ADD	Quality of Subject Matter	Addressing diverse student needs
ACOMP_OPP	Cognitive Engagement	Develop fluency with mathematical skills/procedures
ACOMP_TECH	Cognitive Engagement	Use of technology to explore mathematical concepts or relationships

ACOMP_ENCRG	Assessment and Response to Student Understanding	Encourage student self eval
ACOMP_ACCURACY	Quality of Subject Matter	Accuracy of materials

Derived variables for video domain scores take the form “**VDOMAIN_***domain*,” where “*domain*” is a two-letter code denoting the domain. We provide separate domain score variables for both the three domain structure and the six domain structure. The variables for the three domain structure are used in the primary student outcomes regressions, and are described in the table below:

Variable Name	Domain	Calculation
VDOMAIN_CLASSMAN	Classroom Management	Average of VCOMP_CM1RT, VCOMP_CM2MN, and VCOMP_3DS
VDOMAIN_SOCIALEMO	Social-Emotional Support	Average of VCOMP_SE1RP and VCOMP_SE2EW (excludes VCOM_SE3RT)
VDOMAIN_INSTRUCT	Instruction	Average of VCOMP_AR1ES, VCOMP_AR2TF, VCOMP_AR3AI, VCOMP_CE1DS, VCOMP_CE2MA, VCOMP_CE3US, VCOMP_DC1ND, VCOMP_DC2QT, VCOMP_DC3EP, VCOMP_QS1EC, VCOMP_QS2PG (excludes VCOMP_QS3CT)

The variables for the six domain structure are described below (note that these are not used in the primary student outcomes regressions):

Variable Name	Domain	Calculation
VDOMAIN_AR	Assessment and Response to Student Understanding	Average of VCOMP_AR1ES, VCOMP_AR2TF, VCOMP_AR3AI
VDOMAIN_CE	Cognitive Engagement	Average of VCOMP_CE2MA, VCOMP_CE3US, VCOMP_CM1RT
VDOMAIN_CM	Classroom Management	Average of VCOMP_CM1RT, VCOMP_CM2MN, and VCOMP_3DS (identical to VDOMAIN_CLASSMAN)
VDOMAIN_DC	Discourse	Average of VCOMP_DC1ND, VCOMP_DC2QT, VCOMP_DC3EP
VDOMAIN_QS	Quality of Subject Matter	Average of VCOMP_QS1EC, VCOMP_QS2PG (excludes VCOMP_QS3CT)
VDOMAIN_SE	Social-Emotional Support	Average of VCOMP_SE1RP and VCOMP_SE2EW (excludes VCOM_SE3RT) (identical to VDOMAIN_SOCIALEMO)
VDOMAIN_TOT	Total domain score	Average of VCOMP_AR1ES, VCOMP_AR2TF, VCOMP_AR3AI,

		VCOMP_CE2MA, VCOMP_CE3US, VCOMP_CM1RT, VCOMP_CM1RT, VCOMP_CM2MN, VCOMP_3DS, VCOMP_DC1ND, VCOMP_DC2QT, VCOMP_DC3EP, VCOMP_QS1EC, VCOMP_QS2PG, VCOMP_SE1RP and VCOMP_SE2EW
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Users should note that the variables **VDOMAIN_CLASSMAN** is identical to **VDOMAIN_CM** and **VDOMAIN_SOCIALEMO** is identical to **VDOMAIN_SE**. These variables are replicated in order to aid users in differentiating between the 3 domain and 6 domain structure.

Users looking to perform analyses using the 3 domain structure should use the **VDOMAIN_CLASSMAN**, **VDOMAIN_SOCIALEMO**, and **VDOMAIN_INSTRUCT** variables. Alternatively, video domain analyses using the 6 domain structure should utilize domain scores ending in two letter codes (i.e. **VDOMAIN_AR**, **VDOMAIN_SE**).

5.5 School file variables

The school-level file contains data collected from Statistics Canada, the school sampling resolution, and directly from the countries/economies themselves. Each observation in the file includes all data collected from these sources for one school. The variables we include are:

- **SCHOOL_CLASSIFICATION** – Whether the school is public, private, or some other classification.
- **URBANICITY** – Population density of the region served by the school¹¹.
- **REGION** – Name or code of the region served by the school.
- **PRIVATE** – Indicates whether the school is private.
- **URBAN** – Indicates whether the school is in an urban setting.
- **TEACH_NUM** – Total number of teachers of record at the school.
- **STUD_NUM** – Total number of students enrolled at the school.

The following data was obtained from each participating country/economy:

Country	SCHOOL_CLASSIFICATION	URBANICITY	REGION	PRIVATE	URBAN	TEACH_NUM	STUD_NUM
B-M-V (Chile)	X	X	X*	X	X		X
Colombia	X	X	X	X	X		X
England	X	X	X	X	X		X
Germany*	X	X	X*	X	X		

¹¹ This variable is intended to provide information about a school's location and is not intended to convey information about the richness of a student's learning environment.

K-S-T (Japan)	X	X	X	X	X		X
Madrid (Spain)	X	X	X	X	X	X	
Mexico	X	X	X	X	X	X	
Shanghai (China)	X	X	X**	X	X	X	

* For these countries/economies we have a region *number* but not a region name.

** In Shanghai (China), all schools are in the region “Shanghai.” The file does not contain more specific regional information.

5.6 Teacher log file variables

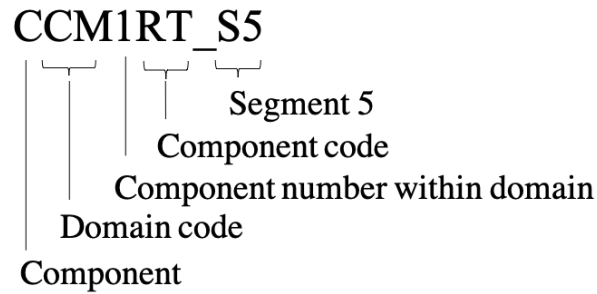
The teacher log file contains data from the teacher log, which was used to document the duration of and mathematics subtopics covered during each lesson. This provides information on the number and order of subtopics covered during the focal unit. Each observation in the file includes data for one lesson by one teacher.

The teacher log includes ID variables and administration variables (noted in Sections 5.1 and 5.2, respectively), duration per lesson (TL02), and strength of focus (0 = not taught, 1 = minor focus, 2 = major focus) for each of the ten subtopics listed below:

- TL03: Handling algebraic expressions (working with brackets and terms)
- TL04: Binominal formulae, e.g. a^2-b^2 , $a^2+2ab+b^2$
- TL05: Introducing one form of a quadratic equation
- TL06A: Solving quadratic equations by completing the square
- TL06B: Solving quadratic equations by factorizing
- TL06C: Solving quadratic equations by the quadratic formula
- TL06D: Solving quadratic equations by finding roots in a graphical representation
- TL07: Discuss different cases of $ax^2+2bx+c=0$ depending on values of a, b, c
- TL08: Quadratic functions (definition, plotting and transforming graphs, etc.)
- TL09: Real life applications

5.7 Video component rating file variables

Raw variables in the video component rating file follow the following naming convention, including information on the component and associated domain, and the segment to which the rating is assigned:



The domain codes are consistent with those given in Section 5.4, but we include the full list of domain codes here for convenience:

Code	Definition
CM	Classroom Management
QS	Quality of Subject Matter
DC	Discourse
SE	Social-Emotional Support
CE	Cognitive Engagement
AR	Assessment and Response to Student Understanding

The observation component codes are also consistent with those given in Section 5.4, but we include the full list of observation component codes here for convenience:

Code	Definition	Domain
OV	Overall score	All
RT	Routines	Classroom Management
MN	Monitoring	Classroom Management
DS	Disruptions	Classroom Management
EC	Explicit connections	Quality of Subject Matter
PG	Explicit patterns and generalisations	Quality of Subject Matter
CT	Clarity	Quality of Subject Matter
ND	Nature of discourse	Discourse
QT	Questioning	Discourse
EP	Explanations	Discourse
RP	Respect	Social-Emotional Support
EW	Encouragement and warmth	Social-Emotional Support
RT	Risk-taking	Social-Emotional Support

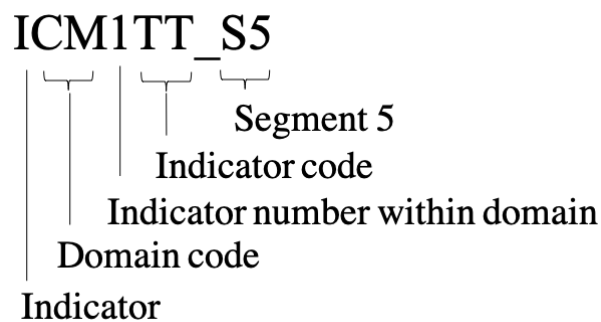
DS	Engagement in cognitively demanding subject matter	Cognitive Engagement
MA	Multiple approaches to / perspectives on reasoning	Cognitive Engagement
US	Understanding of subject matter procedures and processes	Cognitive Engagement
ES	Eliciting student thinking	Assessment and Response to Student Understanding
TF	Teacher feedback	Assessment and Response to Student Understanding
AI	Aligning instruction to present student thinking	Assessment and Response to Student Understanding

In addition to the raw video component rating data, we also include derived variables for the video component rating file at the segment level. These are described below:

- **COM_SCORE_domain_MN_S#** – The average rating over all components associated with a given domain for Segment #, where # takes on the values 1-8.
- **COM_SCORE_TOT_C_S#** – The average rating over all 16 components for Segment #, where # takes on the values 1-8.
- **COM_SCORE_INSTRUCT_S#** – The average rating over all 11 components associated with the Instruction domain for Segment #, where # takes on the values 1-8.

5.8 Video indicator rating file variables

Raw variables in the video indicator rating file follow the following naming convention, including information on the indicator and associated domain, and the segment to which the rating is assigned:



The domain codes are consistent with those given in Section 5.4, but we include the full list of domain codes here for convenience:

Code	Definition
CM	Classroom Management
QS	Quality of Subject Matter

DC	Discourse
SE	Social-Emotional Support
CE	Cognitive Engagement
AR	Assessment and Response to Student Understanding

The observation indicator codes are also consistent with those given in Section 5.4, but we include the full list of observation indicator codes here for convenience:

Code	Definition	Domain
TT	Time on task	Classroom Management
AW	Activity – whole group	Classroom Management
AS	Activity – small group	Classroom Management
AP	Activity – pairs	Classroom Management
AI	Activity – individual	Classroom Management
EL	Explicit learning goals	Quality of Subject Matter
AC	Accuracy	Quality of Subject Matter
RW	Real-world connections	Quality of Subject Matter
CM	Connecting mathematical topics	Quality of Subject Matter
MS	Mathematical summary	Quality of Subject Matter
RG	Types of representations – graphs	Quality of Subject Matter
RT	Types of representations – tables	Quality of Subject Matter
RD	Types of representations – drawings	Quality of Subject Matter
RE	Types of representations – equations	Quality of Subject Matter
RO	Types of representations – objects	Quality of Subject Matter
OP	Organisation of procedural instruction	Quality of Subject Matter
DO	Discussion opportunities	Discourse
PS	Persistence	Social-Emotional Support
RP	Requests for public sharing	Social-Emotional Support
MT	Metacognition	Cognitive Engagement
RU	Repetitive use opportunities	Cognitive Engagement
TU	Technology for understanding	Cognitive Engagement

CT	Classroom technology	Cognitive Engagement
ST	Student technology	Cognitive Engagement
SU	Software use for learning	Cognitive Engagement

In addition to the raw video component rating data, we also include derived variables for the video indicator rating file at the segment level. Raters coded up to three different classroom technology devices in the three classroom technology (CT) variables, and up to three different student technology devices in the three student technology variables (ST). The video indicator rating file includes variables denoting whether each type of technology was present during a segment, taking a value of 1 if true, and 0 if false. These are described below:

- **ICEXCT1_S#** – Derived variable for whether classroom technology device 1, overhead projector, was present during segment #, where # takes on values 1-16.
- **ICEXCT2_S#** – Derived variable for whether classroom technology device 2, smartboard / projector, was present during segment #, where # takes on values 1-16.
- **ICEXCT3_S#** – Derived variable for whether classroom technology device 3, graphing calculator, was present during segment #, where # takes on values 1-16.
- **ICEXCT4_S#** – Derived variable for whether classroom technology device 4, non-graphing calculator, was present during segment #, where # takes on values 1-16.
- **ICEXCT5_S#** – Derived variable for whether classroom technology device 5, computer / laptop, was present during segment #, where # takes on values 1-16.
- **ICEXCT6_S#** – Derived variable for whether classroom technology device 6, television, was present during segment #, where # takes on values 1-16.
- **ICEXCT7_S#** – Derived variable for whether classroom technology device 7, tablet, was present during segment #, where # takes on values 1-16.
- **ICEXCT8_S#** – Derived variable for whether classroom technology device 8, cellular phone, was present during segment #, where # takes on values 1-16.
- **ICEXCT9_S#** – Derived variable for whether no classroom technology device from options 1-8 was present during segment #, where # takes on values 1-16.
- **ICEXST3_S#** – Derived variable for whether student technology device 3, graphing calculator, was present during segment #, where # takes on values 1-16.
- **ICEXST4_S#** – Derived variable for whether student technology device 4, non-graphing calculator was present during segment #, where # takes on values 1-16.
- **ICEXST5_S#** – Derived variable for whether student technology device 5, computer / laptop, was present during segment #, where # takes on values 1-16.
- **ICEXST7_S#** – Derived variable for whether student technology device 7, tablet, was present during segment #, where # takes on values 1-16.
- **ICEXST8_S#** – Derived variable for whether student technology device 8, cellular phone, was present during segment #, where # takes on values 1-16.
- **ICEXST9_S#** – Derived variable for whether no student technology device from options 3-5, 7, 8 was present during segment #, where # takes on values 1-16.

5.9 Artefact rating file variables

The artefact rating file includes ID variables and administration variables (noted in Section 5.1 and Section 5.2, respectively) and raw rating data for artefacts. The administration variables contain information about the availability and scorability of each artefact. The raw rating data includes the following variables:

- **CONN_MATH_REP_RATE** – Rating on the basis of connecting mathematical representations.
- **EXP_PATRN_GEN_RATE** – Rating on the basis of explicit patterns and generalizations.
- **REAL_WORLD_CON_RATE** – Rating on the basis of real-world connections.
- **ASKING_EXPLAN_RATE** – Rating on the basis of asking for explanations.
- **MUL_MATH_METHOD_RATE** – Rating on the basis of using multiple mathematical methods.
- **EXP_LEARN_GOAL_RATE** – Rating on the basis of explicit learning goals.
- **ADD_DIVERSE_NEED_RATE** – Rating on the basis of addressing diverse student learning needs.
- **OPP_PRACTICE_RATE** – Rating on the basis of opportunities to practice a skill or procedure.
- **TECH_UNDERSTAND_RATE** – Rating on the basis of technology for understanding.
- **ENCRG_SELF_EVAL_RATE** – Rating on the basis of encouraging student self-evaluation.
- **ACCURACY_MATERIAL_RATE** – Rating on the basis of the accuracy of materials.
- **SQE_COMP_SQUARE_RATE** – Rating of the level of subtopic coverage for solving quadratic equations by completing the square.
- **SQE_FACTORIZING_RATE** – Rating of the level of subtopic coverage for solving quadratic equations by factorizing.
- **SQE_QUADRATIC_RATE** – Rating of the level of subtopic coverage for solving quadratic equations by using the quadratic formula.
- **SQE_FIND_ROOT_RATE** – Rating of the level of subtopic coverage for solving quadratic equations by finding roots in a graphical representation.
- **FACTOR_EXP_RATE** – Rating of the level of subtopic coverage for factoring expressions.
- **DIFF_CASE_RATE** – Rating of the level of subtopic coverage for discussing different cases of $ax^2+bx+c=0$ depending on values of a , b , and c .
- **EXPLORING_FUNCT_RATE** – Rating of the level of subtopic coverage for exploring quadratic functions (definitions of functions, plotting, and transforming).
- **EXAMINING_REL_RATE** – Rating of the level of subtopic coverage for examining the relationship between the value of the discriminant and the number of solutions to a quadratic equation.
- **APPLY_REAL_WORLD_RATE** – Rating of the level of subtopic coverage for apply mathematics to real world situations.

6 Coding of missing data

There are many possible reasons for missing data, some of which must be handled differently during processing and analysis. The following codes signify different types of missing data, applicable only to the raw variables in the student-level and teacher-level files:

Code	Label
9999	Missing
9998	Multiple responses
9997	Illegible response
9996	School dropped out of study ¹²
9995	Teacher dropped out of study ¹³
9994	Student dropped out of study ¹⁴
9992	Not applicable ¹⁵
9991	Value out of range

¹² This code was used only in the student and teacher questionnaires and the student tests to indicate dropping out of the study. This has been recoded to the MIDDROP indicator variables in the student- and teacher-level files.

¹³ This code was used only in the student and teacher questionnaires and the student tests to indicate dropping out of the study. This has been recoded to the MIDDROP indicator variables in the student- and teacher-level files.

¹⁴ This code was used only in the student and teacher questionnaires and the student tests to indicate dropping out of the study. This has been recoded to the MIDDROP indicator variables in the student- and teacher-level files.

¹⁵ Only used in artefacts.

7 Merging files

Analysis leading to the results in the Global Teaching Insights technical report and policy report (resulting from the TALIS Video Study project) required merging data from multiple files. Here, we describe the how the merging process should be performed.

All files can be merged to one another using the three-part T_ID variable (IDCOUNTRY-IDSCHOOL-IDTEACH), except for the school-level file, which can only be merged using the SCH_ID variable.

To merge the student-level file with the teacher-level file, use T_ID to perform a one-to-many merge process. In Stata, this can be done simply by using the command “merge 1:m T_ID using <file to merge>” while the base file is already loaded.

8 Regression analysis specifics

To reproduce the student outcome regression analyses for student test scores (TEST), personal interest in math (PINT), and general self-efficacy (GENSELFEFF), users will need to apply the following steps:

1. **Generate missingness indicators and “zero-imputed” versions of all teacher scores and covariates used in regressions.** In order to retain students in the analysis who have valid outcome data but are missing data for the predictor variables (e.g., teacher domain/component/indicator scores, “pre” scores, demographic information), we use a simple imputation technique that involves (a) generating binary variables for each predictor that indicate whether a student was missing data for that predictor and (b) replacing missing values for predictors with a value of “0”. Both the imputed version of the predictor and the corresponding missingness indicator are used in the all regression models. We do not impute missing student outcome data.
2. **Use the standardized versions of the both the “pre” and “post” student outcomes.** For interpretability, we generate standardized versions of the three primary student outcomes. These variables are standardized using the sample-wide mean and standard deviation that was calculated by (a) calculating the mean and standard deviation for that outcome in each country and economy and (b) average across the country and economy-specific means and standard deviations. We have included the versions of each outcome standardized in this manner in the student-level data, denoting them with the “pre” (i.e., PRE_TEST, PRE_PINT, PRE_GENSELFEFF) and “post” (i.e. “POST_TEST”, “POST_PINT”, “POST_GENSELFEFF”) prefixes.
3. **Specify the model with the proper predictors.** We use two primary specifications in our analysis: (a) a “No Controls” model which regresses a student’s outcomes on only their teacher’s domain/component/indicator score and an indicator for teacher score missingness and (b) a “Full” model which includes students’ “pre” measure for that outcome, gender (SA_FEMALE), immigration background (SA_IMMIG_I), home possessions (SA_HOMEPOS_IRT), parental education (SA_PARED), classroom averages of these variables (e.g. CLASS_SA_FEMALE) , class average of the pre version of the outcome measures (e.g. CLASS_PRE_TEST), class size (CLASS_SIZE_FULL), and missingness indicators (e.g., MI_VDOMAIN_INSTRUCT, MI_SA_FEMALE) for each of these variables as predictors. For example, to reproduce results regressing student test scores on teachers’ instruction domain, users would fit the following Ordinary Least Squares (OLS) models:

- **No Controls Model**

$$\text{POST_TEST} = \text{VDOMAIN_INSTRUCT_IMPUTE} + \text{MI_VDOMAIN_INSTRUCT}$$

- **Full Model**

$$\text{POST_TEST} = \text{VDOMAIN_INSTRUCT_IMPUTE} + \text{MI_VDOMAIN_INSTRUCT} + \text{PRE_TEST_IMPUTE} + \text{MI_PRE_TEST} + \text{SA_FEMALE_IMPUTE} + \text{MI_SA_FEMALE} + \text{SA_IMMIG_I_IMPUTE} + \text{MI_SA_IMMIG_I} +$$

SA_HOMEPOS_IRT_IMPUTE + MI_SA_HOMEPOS_IRT + SA_PARED_IMPUTE +
MI_SA_PARED + CLASS_PRE_TEST_IMPUTE + MI_CLASS_PRE_TEST +
CLASS_SA_FEMALE_IMPUTE + MI_CLASS_SA_FEMALE +
CLASS_SA_IMMIG_I_IMPUTE + MI_CLASS_SA_IMMIG_I +
CLASS_SA_HOMEPOS_IRT_IMPUTE + MI_CLASS_SA_HOMEPOS_IRT +
CLASS_SA_PARED_IMPUTE + MI_CLASS_SA_PARED + CLASS_SIZE_FULL

4. **Adjust standard errors at the school level.** Lastly, we account for the clustering of student outcomes at the school level by using clustered standard errors that have been cluster-adjusted at the school (SCH_ID) level.

9 Harmonization Tables

Table 1.9.1: Converting SQA01 responses to PISA-equivalent grade level

	B-M-V (Chile)	Colombia	England	Germany*	K-S-T (Japan)	Madrid (Spain)	Mexico	Shanghai (China)
Recoding required to obtain PISA-equivalent grade level	SQA01 + 6	SQA01 + 7	SQA01 + 7	SQA01 + 7	SQA01 + 6	SQA01 + 6	SQA01 + 6	SQA01 + 5

Table 1.9.2: Converting SQA27 – SQA30 responses to ISCED level, harmonizing by country

Item	Response	Response Label	Corresponding ISCED Level	Recoding Required
SQA_27 SQA_29	1	Complementary cycle, normal superior, technical education	3A, 4	
SQA_27 SQA_29	2	Middle education (10 th -11 th grade)	3B, 3C	
SQA_27 SQA_29	3	Basic secondary education (6 th -9 th grade)	2	Germany*: SQB_27= (3 or 4 or 5)
SQA_27 SQA_29	4	Basic primary education	1	Germany*: SQB_27=6
SQA_27 SQA_29	5	Did not complete primary education	None	Germany*: SQB_27= (8 or 9)
SQA_28a SQA_30a	1	Bachelor's, master's, or doctorate	5A, 6	Germany*: SQB_28c=1
SQA_28b SQA_30b	1	Bachelor's, master's, or doctorate	5A, 6	Germany*: SQB_28c=1
SQA_28c SQA_30c	1	Technical education	5B	Germany*: SQB_28d=1
SQA_28d SQA_30d	1	Complementary cycle, normal superior, technical education	3A, 4	Germany*: SQB_28e=1; K-S-T (Japan): N/A; Mexico: N/A

Table 1.9.3: Converting ISCED level to years of education

Country / Economy	ISCED Level 0	ISCED Level 1	ISCED Level 2	ISCED Level 3B or 3C	ISCED Level 3A and/or 4	ISCED Level 5B	ISCED Level 5A or 6
B-M-V (Chile)	3	6	8	12	12	16	17
Colombia	3	5	9	11	11	14	15.5
England	3	7	10	11	12	14	16
Germany*	3	4	10	13	13	15	18
K-S-T (Japan)	3	6	9	12	12	14	16
Madrid (Spain)	3	5	8	10	12	13	16.5
Mexico	3	6	9	12	12	14	16
Shanghai (China)	3	6	9	12	12	15	16.5

Table 1.9.4: Harmonizing TQB03 and TQB04 to reflect a consistent measure of teacher qualification

Item	Associated derived variable	Country / Economy requiring recoding	Recoding performed
TQB_03	TB_QUALIFICATION	B-M-V (Chile)	4 to 3; 5 to 4; 6 to 5
TQB_03	TB_QUALIFICATION	Madrid (Spain)	3 to 4; 4 to 5
TQB_04	TB_TEACHQUAL	Germany*	1 and 2 to 1; 3 to 2; 4 to 3; 5 to 4; 6 to 5

